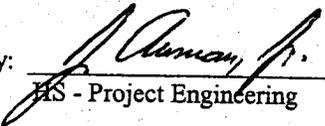


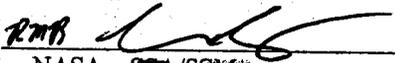
NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
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151FM05				
ELECTRICAL POWER HARNESS, ITEM 151 ----- SV789151-4 (1)	3/1RAB	Electrical open, fan winding power line.	END ITEM: Loss of continuity in one of two redundant power lines.	A. Design - SV789151-4 Open circuits in any of the circuits in the Item 151 harness are minimized by the following: a. Conductors are hard potted in Stycast 2651 in the area that they interface with the metal backshells to minimize their movement and chance of shorting to the backshell. b. The conductors are strain relieved at the connector/harness interface with a molded rubber backshell. This minimizes the effects of cable tension on the individual conductors. c. Conductors are sheathed within a woven Nomex outer layer. This holds the cables together to share any loading. d. #22 and #24 AWG Teflon jacketed wires provided electrical and mechanical properties which help prevent breakage. e. Each connector/adaptor ring interface is locked in place to prevent rotation by a mechanical and adhesive lock. Crimping per SVSH4909 (based on MSFC-Spec-Q-1A).
Or ----- SV824051-1 (1)		Cable chafing against connector shell or shield. Improper connector strain relief, faulty connection between the connector and the lead wires, conductor severed, contact resistance.	GFE INTERFACE: Loss of one of two redundant fan power lines. Slight increase (0.05 ohms) in path resistance.	SV824051-1 Open circuits in any of the circuits in the item 151 harness are minimized by the following: Connectors of all metal construction with smooth internal edges (0.010" min. corner radius) on backshell housings to prevent cable chafing are used. Each connector/backshell interface is locked in place by a mechanical lock to prevent rotation. Each connector/cable interface is strain relieved by the use of a connector backshell strain relief nut, collet, and pressure sensitive tape as required to secure the electrical cable. The #22 and #24 Teflon insulated wires and connector provide electrical conduction and insulation properties. Connector pins are operating at 56.7% of derated temperature and the wire at 70.7% of derated current. A woven Halar sheath is assembled over the cable wire bundles to provide load sharing and protection from abrasion and impact. Wire crimping is performed per NHB5300.4 (3H).
			MISSION: None for single failure. Terminate EVA for loss of both power lines.	
			CREW/VEHICLE: None for single or double failure. Possible loss of crewman with loss of SOP.	B. Test - Component Acceptance Test - SV789151-4 The harness is acceptance tested per the following tests of AT-EMU-151 to ensure there are no workmanship problems which would cause actual or potential open circuits. Pull Test - This test subjects each connector/harness interface to a specific pull test (9 pounds) designed to exceed any stress encountered in actual use. The insulation resistance between each conductor and the ground circuit is measured during the test to ensure there is no shorting. The test is followed by a continuity check of each conductor path to ensure there are no open circuits. Continuity Test - The resistance of each circuit is measured to ensure there are no open circuits or high resistance paths.
			TIME TO EFFECT /ACTIONS: Seconds.	
			TIME AVAILABLE: Days.	
			TIME REQUIRED: Days.	
			REDUNDANCY SCREENS: A-FAIL	SV824051-1 The 151 harness is subjected to acceptance testing per AT-E-151-1 prior to final acceptance to ensure there are no workmanship problems that could cause an open or short circuit. Each connector/harness interface is subjected to a 9 - 10 pound pull test. The insulation resistance between each conductor and ground

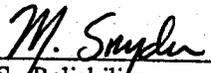
NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		151FM05	B-FAIL C-PASS	<p>circuit is measured during this test to ensure there are not intermittent shorts and to verify the integrity of the harness strain relief. A continuity test is performed to measure the resistance of each circuit to ensure there are not open circuits or high resistance paths. The insulation resistance and dielectric strength between each conductor and the shield ground is measured to ensure there are no shorts.</p> <p>PDA Test - An open circuit in the fan windings power lines would not be detected during PLSS PDA testing per SEMU-60-010 because of winding power line redundancy.</p> <p>Certification Test - SV789151-4 Certified for a useful life of 18 years (ref. EMUM1-0099).</p> <p>SV824051-1 Certified for a useful life of 15 years (ref. EMU1-13-046).</p> <p>C. Inspection - SV789151-4 During harness manufacturing, the following inspections are performed to ensure there are no open circuits.</p> <ul style="list-style-type: none"><li>a. Visuals inspection of conductors prior to potting operations to ensure there are no damaged conductors and that the conductors are routed properly.</li><li>b. Visual inspection of the harness prior to and after rubber boot molding process to ensure there are no damaged conductors which could causes an open circuit.</li><li>c. In-process electrical checkout of the harness before and after potting and molding to ensure there are no open circuits.</li><li>d. Visual inspection of the conductors prior to application of the outer sheath to ensure there are no damaged conductors that could cause an open circuit.</li><li>e. Contact crimp samples are made prior to and after crimping to ensure the crimping tools are working properly. This ensures there will not be any high resistance problems at the contacts.</li></ul> <p>SV824051-1 To ensure that there are no workmanship problems which could cause an open or short circuit in the harness conductors, the following inspections are made: Contact crimp samples are made prior to start of crimping and at the conclusion of crimping and pull tested to ensure the crimp tooling is operating properly. Electrical bond test is performed to verify ground path through various points on the harness. In-process and final electrical checkout of the harness (conductor continuity, dielectric strength, and insulation resistance tests) are performed to ensure there are not open/short circuits. All crimp terminations are inspected for defects.</p> <p>D. Failure History - SV789151-4 The following RDR's were issued for Item 151 due to open circuits. H-EMU-151-D001 - (7/08/83) Intermittent open due to a broken wire at the P12 connector during acceptance testing. This failure was caused by a workmanship problem. The corrective</p>

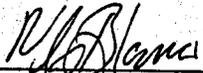
NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
		151FM05		<p>action taken was to add a visual inspection prior to molding. H-EMU-151-D002 - (12/14/83) Intermittent open due to a broken wire at the P3 connector during acceptance testing due to a workmanship problem. The corrective action taken was to issue EC 42806-527 which fixes the angular location of the P3 adapter ring slot to insure proper wire exit and EC 42806-527-2 which requires that a pull test be performed to detect opens.</p> <p>SV824051-1 None.</p> <p>E. Ground Turnaround - None, this failure mode can not be detected during normal ground turnaround testing because of the redundant design of the power line in the harness.</p> <p>F. Operational Use - Crew Response - PreEVA/EVA: No response, single failure undetectable by crew or ground. Training - No training specifically covers this failure mode. Operational Considerations - EVA Checklist and FDF procedures verify hardware integrity and systems operatioanl status prior to EVA. Real Time Data system allows ground monitoring of EMU systems.</p>

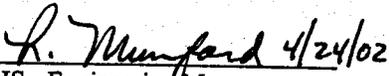
EXTRAVEHICULAR MOBILITY UNIT  
SYSTEMS SAFETY REVIEW PANEL REVIEW  
FOR THE  
I-151 ELECTRICAL POWER HARNESS  
CRITICAL ITEM LIST (CIL)  
EMU CONTRACT NO. NAS 9-97150

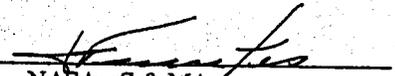
Prepared by:   
HS - Project Engineering

Approved by:   
NASA - ~~SSA~~/SSM  
ZSS

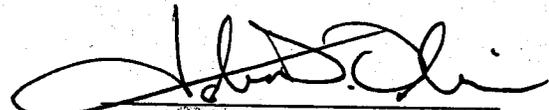
  
HS - Reliability

  
NASA - EMU/SSM

 4/24/02  
HS - Engineering Manager

  
NASA - S & MA

  
NASA - MOD

  
NASA - Crew

  
NASA - Program Manager